

to permit a "follow-through" landing. Until the undercarriage has been retracted few fully loaded twin-engined machines, with the best take-off flap setting, can continue to climb on one engine. With the length of runway which becomes a practical possibility in the case of strip landing grounds, an immediate landing will always be possible.

According to present ideas a width-margin of 300 yards is necessary to allow for directional errors during a blind approach. The strips which are visualised, therefore, will be of this width, and as far as blind approaches are concerned the Maclaren undercarriage should certainly simplify the procedure. In conditions of fog there is very rarely much wind and the landing can be made straight off the approach. By far the most dangerous conditions, however, are those in which heavy snow is falling, with the accompaniment of a strong wind and, perhaps, low cloud. Although the ground may eventually be seen from a safe direct approach height, this height is still not sufficient for the pilot to make a half-circuit before turning into wind after he has found the aerodrome at the end of the blind approach line. With the Maclaren undercarriage the machine would come down the beam in the ordinary way, after runs have been made along this line in order to correct the drift on the directional gyro, and the wheel angles would already be set for the drift effect at touch-down speed.

Long-Range Possibilities

For very special long-range work, whether with civil or military machines, the practical use of strip landing grounds offers considerable advantages. Concrete tracks could be arranged at no great cost and with no greater technical and geographical problems than those involved in the layout of a modern arterial road. For such work these tracks could even be arranged at a considerable gradient so that a heavily loaded machine would have the advantage of this incline in the take-off acceleration. Any machine with a sufficient margin of power to fly at all could be got in the air safely and without the need for any form of assistance. Take-off analysis shows that with a gradient of 1 in 10 a level run of 400 yards is reduced to a little less than 250 yards. With all present schemes for assisted take-off, the heavily loaded machine becomes, so to speak, an orphan once it is airborne. With the steerable undercarriage the machine is carrying its own take-off assister.

Less important, perhaps, are the possibilities in the training and light aircraft field. The device would, however, permit the use of aerodromes which are small in overall area, and these strips could, therefore, be provided fairly cheaply within population centres. Even the overhead city airport, long considered by academic enthusiasts, becomes a more reasonable proposition. The track in this case need not even be opaque, but could be constructed, for instance, of light steel mesh so that some light was permitted for the unfortunate mortals living below.

All Mr. Maclaren's initial experiments are being carried out with the Arpin pusher, with the collaboration of its designer. This machine lent itself admirably to the work, and is, in fact, probably the only really suitable one at present available in this country. Not only is it designed around the conventional tricycle type of landing gear, but

the undercarriage fittings are exceptionally robust, and the whole machine may be treated as a convenient miniature edition of those to which the Maclaren undercarriage is intended to apply. At the moment, the prototype Arpin, which was described in *Flight* of November 25, 1937, and May 12 this year, is fitted with a Salmson engine, but this unit may presently be replaced by a Cirrus Minor.

The first serious test work was carried out on a day on which the ground wind-speed was probably as high as 25 m.p.h.—at any rate, ordinary light aeroplanes were unable to leave the hangars, and even more heavily loaded Service types could only be taxied with the ground staff at the wing-tips. The scene of the experiments is Luton airport, where there is ample area and insufficient general flying to cause really serious delays. Both take-offs and landings made broadside to the strong wind were carried out without difficulty, and neither from the pilot's nor the passenger's point of view was there any sensation of insecurity. The only difficulty concerned the taxiing process, which was done of necessity with the undercarriage wheels still at the correct cross-wind angle, since the Arpin is fitted with a temporary arrangement for experimental purposes. The three wheels are, of course, adjustable on the ground to an angle suitable for prevailing conditions, but the machine must be taxied out and back in a somewhat difficult directional attitude. Incidentally, there is no reason at all why the Maclaren principle should not be applied to the ordinary undercarriage or to the B.L.G. type of tricycle.

Angle Adjustment

In practice the angle adjustment will be made from the pilot's seat, so that this angle can, therefore, be altered according to the pilot's own calculations. All he will need, knowing his own landing speed, is the prevailing direction and speed of the wind at ground level. Alternatively, and particularly in bad weather conditions when he would be otherwise employed, this angle could be worked out for him by the ground staff and given to him by radio in the same way as that in which barometric pressure is provided for altimeter adjustment before starting a blind approach. The suggested angle indicator might take the form of a horizontally mounted needle moving against a degree scale, and in weather conditions in which the ground can be seen the undercarriage angle will be adjusted until this needle is pointing in the direction of actual travel while the machine is crabbing across wind down the line of the landing strip.

Directional control is provided by a steerable and castering nose wheel in the ordinary way, though the neutral position of the wheel is, of course, set with a bias similar to that of the main undercarriage wheels. Except for the fact that the machine itself is not travelling in the fore and aft axis of the fuselage, there should be nothing very difficult or strange about the ground control.

It is impossible to be merely indifferent about this device, which is being handled by the Maclaren Undercarriage Co., Ltd., of 1, Oxford Court, Cannon Street, London, E.C.4. Either it is extremely important or it is of no practical interest whatever.

H. A. T.

South American Survey

IN the course of an address before the British Society in Buenos Aires, Mr. W. D. Roberts, who is leading the British Airways mission in South America, explained some of the difficulties involved in planning a service to West Africa and across the Atlantic to South America. These difficulties are particularly noticeable when other international services have already been operating over the same route for several years.

The service not only has to be operated through foreign countries, but a decision has to be reached concerning the type of machine, whether landplane or flying-boat, to be used, and a complete system of radio and meteorological facilities has to be arranged over the entire route.

The very fact, he explained, that other companies had already provided practically all their own organisation made it specially necessary for British Airways to evolve an equally efficient or even better system. He said that the task of the mission had been materially assisted by help both from the

British community and the Argentine Government, but it was at present impossible to say exactly when the service would start. In the course of his remarks Mr. Roberts said that the Argentine Government had recently decided to construct a really up-to-date central airport for Buenos Aires.

The New LeO

THE prototype of the series of six Lioré et Olivier 24-0 flying boats which have been ordered by Air France for use on their Mediterranean services is now ready for tests at Etang de Berre. This machine was recently damaged during take-off and has been undergoing repairs. It made its first flight on September 30, 1937.

It will be remembered that Air France intend to re-equip their Mediterranean fleet with these 26-passenger 200 m.p.h. flying boats. Four Hispano 12 Xi engines of 690 h.p. are placed in line along the leading edge of the wing. The all-up weight of the new LeO is 13 tons, and a crew of four will be carried. The range is 700 miles; cruising speed 160 m.p.h.